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**FULL CONTENTS CLAIM + DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART  
EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS EXAMPLE**

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**Notes:**

1. Untranslatable words are replaced with asterisks (\*\*\*\*).
2. Texts in the figures are not translated and shown as it is.

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**CLAIM + DETAILED DESCRIPTION**

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**[Claim(s)]**

[Claim 1] The fluorine system polymer composition which is a fluorine system polymer composition containing a filler, and is characterized by carrying out the surface treatment of this filler with a fluoro alkyl-group content compound.

[Claim 2] The fluorine system polymer composition according to claim 1 which is that to which a filler has a fluoro alkyl group originating in a fluoro alkyl-group content compound on the surface.

[Claim 3] The fluorine system polymer composition according to claim 1 or 2 whose fluoro alkyl-group content compound is a fluoro alkyl-group content silane compound.

[Claim 4] The fluorine system polymer composition according to claim 1 to 3 whose filler is a conductive filler.

[Claim 5] The fluorine system polymer composition according to claim 4 whose conductive filler is carbon black.

[Claim 6] The fluorine system polymer composition according to claim 4 whose conductive filler is a metal oxide.

[Claim 7] The fluorine system polymer composition according to claim 4 to which conductive fillers are carbon black and a metal oxide, and the surface treatment of the either is carried out with a fluoro alkyl-group content compound.

[Claim 8] The conductive belt characterized by being fabricated from a constituent according to claim 1 to 7.

[Claim 9] The conductive belt according to claim 8 whose conductive belt is a seamless belt.

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**[Detailed Description of the Invention]****[0001]**

[Field of the Invention] this invention relates to the fluorine system polymer composition containing a filler -- further -- detailed In the conductive fluorine system polymer composition excel in the dispersibility of a filler and using the conductive filler especially It consists of a fluorine system polymer composition which lost change of the resistance by temporality, and this constituent, and is related with the conductive belt used suitably for an electrophotography copying machine, a printer, a facsimile machine, etc.

**[0002]**

[Description of the Prior Art] As the conductive belt currently conventionally used abundantly in middle transcription equipment, such as an electrophotography copying machine, a printer, and a facsimile machine, transcription separation equipment, conveyance equipment, electrification

equipment, a developer, etc., The thermoplastics constituent which blended conductive fillers, such as carbon black, and gave conductivity is used, and fluorine system polymers which are excellent in fire retardancy, endurance, filming-proof nature (toner mold-release characteristic), etc., such as fluororesin or rubber, are mainly used as the thermoplastics.

[0003] However, the conductive belt which consists of a constituent which blended the conductive filler with these fluorine system polymers, For example, in a middle transcription belt, the resistance fell temporally with high voltages by which repetition impression is carried out, such as corona discharge, and there were problems, like the amount of shift of toner decreases and the picture obtained becomes indistinct.

[0004] this invention person etc. proposes the constituent which blended other conductivity fillers, such as carbon black and a metal oxide, with the fluorine system polymer that this problem should be solved (refer to JP,H10-34763,A.), Although the improvement was under examination succeedingly Also in this constituent, as for losing the temporal fall of that resistance, although it became possible, that discovery was not stabilized, for example, variation occurred with the manufacture lot and it became clear that it was inherent in problems, like the surface smoothness of a belt becomes sometimes poor.

[0005]

[Problem(s) to be Solved by the Invention] This invention was made in view of the above-mentioned conventional technology, and [ therefore, this invention ] It excels in the dispersibility of the filler in a filler content fluorine system polymer composition, and aims at offering the conductive belt which consists of a fluorine system polymer composition which suppressed the fall of the resistance by temporality, and this constituent in the conductive fluorine system polymer composition using a conductive filler especially.

[0006]

[Means for Solving the Problem] It is what found out that said purpose could be attained by carrying out the surface treatment of the filler to blend with the compound which has a specific organic group as a result of inquiring wholeheartedly that this invention person etc. should attain said purpose, and completed this invention. That is, this invention is a fluorine system polymer composition containing a filler, and this filler makes a summary the conductive belt fabricated from the fluorine system polymer composition by which a surface treatment is carried out with a fluoro alkyl-group content compound, and this fluorine system polymer composition.

[0007]

[Embodiment of the Invention] As a fluorine system polymer which constitutes a fluorine system polymer composition in this invention Specifically, for example Polytetrafluoroethylene, polychlorotrifluoroethylene resin, Homopolymers, such as polyvinylidene fluoride and polyvinyl fluoride, an ethylene tetrafluoroethylene copolymer, An ethylene chlorotrifluoroethylene copolymer, a tetrafluoroethylene hexafluoropropylene copolymer, Resin, such as copolymers, such as a tetrafluoroethylene perfluoroalkyl vinyl ether copolymer, A fluoridation vinylidene chlorotrifluoroethylene copolymer, a fluoridation vinylidene hexafluoropropylene copolymer, Rubbers, such as a fluoridation vinylidene hexafluoropropylene tetrafluoroethylene copolymer and tetrafluoro ethylene propylene rubber, and the hard segment of the polymer block which constitutes said fluororesin, The thermoplastic elastomer which consists of a soft segment of the polymer block which constitutes said fluorine system rubber is mentioned.

[0008] In these, polychlorotrifluoroethylene resin, polyvinylidene fluoride resin, polyvinyl fluoride resin, ethylene tetrafluoroethylene copolymer resin, tetrafluoroethylene perfluoroalkyl vinyl ether copolymer resin, etc. are desirable in this invention.

[0009] moreover, as a filler which constitutes a fluorine system polymer composition A conductive filler is desirable and specifically, for example Carbon black, Carbon system conductivity fillers, such as graphite, a carbon fiber, activated carbon, and charcoal, Powder, such as aluminum, silver, copper, iron, nickel, zinc, and stainless steel, Metal system conductivity fillers, such as the shape of a flake, and fibrous, a zinc oxide, tin oxide, Iron oxide, copper oxide, titanium oxide, aluminium oxide, indium oxide, Zirconium oxide, an aluminum dope zinc oxide, antimony dope tin oxide, Metal oxide system conductivity fillers, such as tin dope indium oxide and tin oxide covering titanium oxide, molybdenum disulfide, etc. are mentioned, in addition as a non-conductive filler Calcium carbonate, magnesium carbonate, barium carbonate, aluminium hydroxide, Magnesium hydroxide, magnesium oxide, barium sulfate, silica, a talc, A hide ROTARU site, kaolinite, Clay, zeolite, montmorillonite, Resin, such as inorganic fillers, such as bentonite, wollastonite, diatomaceous earth, mica, titanic acid Cali, a boron fiber, glass fiber, a glass bead, a glass balloon, and boron nitride, and polyethylene, a wood meal, pulp, Organic fillers, such as chaff, etc. are mentioned.

[0010] As mentioned above in this invention in these, it is suitable to consider it as the combined use with carbon black and other conductivity fillers, such as a metal oxide, as what can suppress the

temporal fall of the resistance in a conductive belt.

[0011] [ in addition, the resistance as a conductive filler in this invention ] 100kg/cm<sup>2</sup> As a value in pressure, it is desirable that they are 1x10<sup>-5</sup> - 1x10<sup>12</sup> ohm-cm, it is still more desirable that they are 1x10<sup>-5</sup> - 1x10<sup>10</sup> ohm-cm, and it is desirable that they are especially 1x10<sup>-5</sup> - 1x10<sup>5</sup> ohm-cm.

[0012] In the fluorine system polymer composition of this invention, [ said filler ] or [ that make it indispensable to carry out a surface treatment and a surface treatment is not carried out with a fluoro alkyl-group content compound ] -- or Even if the surface treatment is carried out, when being made with compounds other than a fluoro alkyl-group content compound As a fluorine system polymer composition, the dispersibility of a filler will be inferior and it becomes difficult especially in the conductive fluorine system polymer composition using a conductive filler to suppress the fall of the resistance by temporality.

[0013] in addition -- although the effect of this invention is what is obtained if those surface treatments of at least the above [ a kind ] are made when the filler to contain is two or more sorts in the fluorine system polymer composition of this invention -- any -- although -- it is desirable that the aforementioned surface treatment is especially made.

[0014] [ here ] as a fluoro alkyl-group content compound used for a surface treatment Preferably [ that it is what has further reactant machines, such as an alkoxy group, a hydroxyl group, and an amino group, while having a fluoro alkyl group ], and specifically For example, trifluoromethyl trimethoxysilane, pentafluoroethyl triethoxysilane, JI (trifluoromethyl) fluoro methoxymethyl trimethoxysilane, Fluoro alkyltrialkoxysilane compounds, such as PENTADEKAFURUORO heptoxy methyl triethoxysilane, 1H, 1H and 2H, and 2H-heptadeca fluoro \*\*\*\*\*- trimethoxysilane, are mentioned as a suitable thing.

[0015] [ the surface treatment of said filler with said fluoro alkyl-group content compound ] or [ sinking a filler into a fluoro alkyl-group content compound ] -- or although made by covering the surface of a filler with a fluoro alkyl-group content compound, or making a fluoro alkyl-group content compound adsorb on the surface of a filler with the conventional method of spraying etc. For example, [ introducing the mixture which mixed the fluoro alkyl-group content compound and the filler by the mixer etc. in a processing container, and making it flow under churning with a screw feeder etc. ] It is especially desirable to apply the impulse force by jet air currents, such as air and nitrogen, to carry out grinding processing, to make the fluoro alkyl group originating in a fluoro alkyl-group content compound combine with the grade which a mechanochemical reaction produces chemically, and to make a fluoro alkyl group have on the surface of a filler. In addition, in these surface treatments, said fluoro alkyl-group content compound is used in about 0.01 to 10weight % of quantity by the total quantity with said filler.

[0016] Moreover, in order to prepare the fluorine system polymer composition of this invention from a fluorine system polymer and the filler by which the surface treatment was carried out with the fluoro alkyl-group content compound A 1 axis extruding machine, a twin screw extruder, a roll, a Banbury mixer, the Brabender plastograph, It is made to pulverize and mix with solution form using grinders, such as the method of kneading, where a fluorine system polymer is fused and a roll mill, a bead mill, a sand mill, a ball mill, a colloid mill, and a high speed DISU purser, using kneading machines, such as a kneader, and is based on conventional methods, such as the method of drying.

[0017] Although the fluorine system polymer composition of this invention may be fabricated by the Plastic solid of various form by the molding method usually used in thermoplastics, for example, an extrusion method, compression forming, an injection-molding method, a blow molding method, etc. In inside, it is fabricated by the shape of a flat, a tube shape film, or the sheet by extrusion using a conductive thing as a filler. It is suitable as a seamless belt which was suitably used as conductive belts of business, such as an electrophotography copying machine, a printer, and a facsimile machine, and was especially fabricated by tube shape.

[0018] The fluorine system polymer composition of this invention can acquire the Plastic solid which the dispersibility of the filler was excellent, and decreased the development gas at the time of fabrication, and was excellent in surface appearance. And it sets to the conductive belt made suitable as a Plastic solid, for example, especially a conductive seamless belt. Surface roughness Ra 0.3 micrometer or less and a surface resistance value 1x10<sup>2</sup> to 1x10<sup>15</sup>ohms / \*\*, 1x10<sup>8</sup> to 1x10<sup>13</sup>ohms / \*\*, and a volume resistance value preferably 1x10<sup>2</sup> - 1x10<sup>15</sup> ohm-cm, when it is the range of 1x10<sup>-8</sup> - 1x10<sup>13</sup> ohm-cm preferably, voltage is impressed every [ during 10 seconds ] every 50V from 50V to 500V and this operation is repeated 3 times The volume resistance value at the time of the 3rd 300V impression (rhov3) is 1x10<sup>7</sup>. More than omega-cm The common logarithm value of the ratio (rhov3/rhov1) of the volume resistance value (rhov3) at the time of 3rd 50V impression to the volume resistance value at the time of 1st 50V impression (rhov1) is the outstanding thing of more than -0.6 which passes and has the Tokiyasu quality.

[0019]

[Example] Hereafter, although a work example explains this invention still more concretely, this invention is not limited to the following work examples, unless the summary is exceeded. In addition, the fluorine system polymer used in the following work examples and comparative examples and a filler are shown below, respectively.

[0020] Fluorine system polymer \*\* ethylene tetrafluoroethylene copolymer resin ("AFURON C55 A-B" by Asahi Glass Co., Ltd.)

\*\* Ethylene tetrafluoroethylene copolymer resin ("AFURON LM740 A-B" by Asahi Glass Co., Ltd.)

\*\* Polyvinylidene fluoride resin (made by Atochem "Kiner 720")

[0021] Filler \*\* acetylene carbon black (the "DENKA black" by DENKI KAGAKU KOGYO K.K.)

\*\* Aluminum dope zinc oxide ("23-K (C)" by Hakusui Chemical Industries)

[0022] \*\* As said aluminum dope zinc oxide as a filler, and a finishing agent [ the mixture which mixed \*\* 1H, 1H, and 2H and 2H-heptadeca fluoro \*\*\*\*\*- trimethoxysilane ("KBM7803" by a Shinetsu silicone company) by the mixer ] The thing which made the fluoro alkyl group which applies the impulse force by an air style, carries out grinding processing at the grade which a mechanochemical reaction produces, and originates in a fluoro alkyl-group content compound while introducing in a processing container and making it flow under churning with a screw feeder combine with the filler surface chemically.

[0023] \*\* the aluminum dope zinc oxide which carried out the surface treatment of the outside which replaced with above "KBM7803" as a finishing agent, and used methyl trimetoxysilane like the aforementioned \*\*.

[0024] It is cylinder temperature of 280 degrees C with a twin screw extruder at the rate which shows the fluorine system polymer shown in one to work-examples 1-3 and comparative example 5 table 1, and a filler in Table 1. Fusion kneading was carried out, after extruding in the shape of a strand and pelletizing, about this pellet, by measuring the development gas volume at the time of high temperature by the method shown below, the dispersibility of the filler was evaluated and the result was shown in Table 1.

[0025] using "AGS-700" by Anelva CORP. as a development gas volume gas analyzing apparatus -- measurement gas helium -- as the 80ml rate of flow for / The molecular weight 18 (H<sub>2</sub>O) at the time of carrying out temperature up of about 200mg of the pellet samples from normal temperature by a part for 10-degree-C/to 340 degrees C and the development gas volume of the molecular weight 44 (CO<sub>2</sub>) were measured.

[0026] Furthermore, the 150-micrometer-thick tube shape film was fabricated by cooling by the cooling mandrel which supplied the obtained pellet to the 1 axis extruding machine, extruded from the annular die of 100mm of outer diameters to tube shape with the die temperature of 310 degrees C, installed in the inside of a tube, and carried out temperature control to 140 degrees C.

[0027] It is the method which cuts the obtained tube shape film into round slices at a length of 200mm, makes conductive belt material, and is shown below, By measuring a surface resistance value and a volume resistance value for the dispersibility of a filler, by measuring the resistance according conductivity to temporality, the stability of resistance with the passage of time was evaluated, respectively, and the result was shown in Table 1 by measuring and observing surface roughness and surface appearance.

[0028] using "SURFCOM" by Tokyo Seimitsu Co., Ltd. as a surface roughness surface roughness meter -- JIS Arithmetic-mean-roughness Ra specified to B0601 It measured.

[0029] An area of 100mm x 1000mm of the surface appearance film surface was observed visually, and the following standards estimated.

O; the projection which can be checked visually is five or less pieces, and further, when it puts to a fluorescent lamp, a detailed projection is hardly accepted.

O; the projection which can be checked visually is five or less pieces, and further, when it puts to a fluorescent lamp, a detailed projection is accepted slightly.

\*\*; the projection which can be checked visually is 6-10 pieces.

x; the projection which can be checked visually is 11 or more pieces.

[0030] Using "Huy Lester IP" by Mitsubishi Chemical as a surface resistance value (rhos) ohm-meter, voltage 500V was impressed for 10 seconds, and HA terminal (made by Mitsubishi Chemical) was pushed and measured by 1kg of load.

[0031] impressing voltage 100V for 10 seconds, using "R8340A" by ADVANTEST CORP. as a volume resistance value (rhov) ohm-meter -- JIS The terminal based on K6911 was pushed and measured by 4kg of load.

[0032] when impressing voltage every [ during 10 seconds ] every 50V from 50V to 500V and repeating this operation 3 times, using "R8340A" by ADVANTEST CORP. as a resistance ohm-meter by temporality, the volume resistance value at the time of the 3rd 300V impression (rhov3) was measured.

[0033] when [ moreover, ] impressing voltage every [ during 10 seconds ] every 50V from 50V to 500V and repeating this operation 3 times, The volume resistance value at the time of 1st 50V impression (rhov1) and the volume resistance value at the time of 3rd 50V impression (rhov3) were measured, respectively, and the common logarithm value of the ratio (rhov3/rhov1) of the latter to the former was computed.

[0034]

[Table 1]

表1

	実施例1	比較例1	比較例2	実施例2	比較例3	実施例3	比較例4	比較例5
組成物(重畳部)								
フッ素系高分子 ①	100	100	100		100			
②				100				
③					100			
フィラー ①	15	15	15	15	15	100	100	100
②		13			13	8	8	10
③						6	6	
④	13		13					
分散性								
H <sub>2</sub> O発生ガス量(μl/g)	292	472	—*	250	301	17	—*	9
CO <sub>2</sub> 発生ガス量(μl/g)	29	32	—*	25	30	2	—*	2
表面粗さ(μm)	0.16	0.32	0.70	0.24	0.48	0.04	0.50	0.12
表面外観	◎	×	×	○	×	◎	×	◎
導電性								
表面抵抗値ρ <sub>s</sub> (Ω/□)	1.3×10 <sup>11</sup>	2.0×10 <sup>10</sup>	>1.0×10 <sup>13</sup>	2.0×10 <sup>10</sup>	6.0×10 <sup>11</sup>	1.0×10 <sup>9</sup>	1.0×10 <sup>10</sup>	2.0×10 <sup>9</sup>
体積抵抗値ρ <sub>v</sub> (Ω·cm)	1.2×10 <sup>11</sup>	2.0×10 <sup>11</sup>	1.0×10 <sup>13</sup>	3.0×10 <sup>11</sup>	3.0×10 <sup>12</sup>	1.0×10 <sup>9</sup>	1.0×10 <sup>9</sup>	6.0×10 <sup>9</sup>
抵抗の経時安定性								
ρ <sub>vs</sub> (Ω·cm)	6.0×10 <sup>-7</sup>	1.0×10 <sup>-6</sup>	<1.0×10 <sup>-7</sup>	4.0×10 <sup>-6</sup>	<1.0×10 <sup>-7</sup>	5.0×10 <sup>-7</sup>	<1.0×10 <sup>-7</sup>	<1.0×10 <sup>-7</sup>
log(ρ <sub>vs</sub> /ρ <sub>vi</sub> )	-0.37	-0.55	-2.50	-0.59	-1.64	-0.58	-2.01	-1.62

\* 「—」は測定せず。

[0035]

[Effect of the Invention] In the conductive fluorine system polymer composition according to this invention, excel in the dispersibility of the filler in a filler content fluorine system polymer composition, and using the conductive filler especially, The conductive belt which consists of a fluorine system polymer composition which suppressed the fall of the resistance by temporality, and this constituent can be offered.

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(21)出願番号	特願平11-94511	(71)出願人	000005968 三菱化学株式会社 東京都千代田区丸の内二丁目5番2号
(22)出願日	平成11年4月1日(1999.4.1)	(72)発明者	西川 学 茨城県稲敷郡阿見町中央8丁目3番1号 三菱化学株式会社筑波研究所内
		(72)発明者	渡辺 朗 茨城県稲敷郡阿見町中央8丁目3番1号 三菱化学株式会社筑波研究所内
		(74)代理人	100103997 弁理士 長谷川 曜司
			最終頁に続く

(54)【発明の名称】 フッ素系重合体組成物及びそれからなる導電性ベルト

(57)【要約】

【課題】 フィラー含有フッ素系重合体組成物におけるフィラーの分散性に優れ、特に、導電性フィラーを用いた導電性フッ素系重合体組成物において、経時による抵抗値の低下を抑えたフッ素系重合体組成物、及び、該組成物からなる導電性ベルトを提供する。

【解決手段】 フィラーを含有するフッ素系重合体組成物であって、該フィラーが、フルオロアルキル基含有化合物によって表面処理されたものであるフッ素系重合体組成物、及び、該フッ素系重合体組成物から成形された導電性ベルト。